

## LIMNIC ERUPTIONS STATIONS #2A and 2B TEACHER NOTES

**KWLA Question:** How would CO<sub>2</sub> affect the water in Lake Nyos?

**Inquiry:** Have students identify some changes that may occur when CO<sub>2</sub> gas dissolves in lake water and devise an experiment to test their hypothesis.

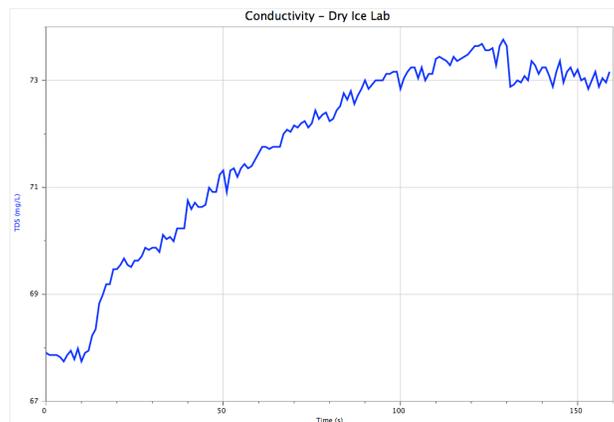
### Potential Investigations and alternate methods:

**2A - How does the dissolving of CO<sub>2</sub> in the lake affect the conductivity of the lake water?**

**Notes:**

1. A handheld conductivity tester may be used instead of conductivity probes. Data will need to be recorded at intervals and graphed manually.
2. Rather than using dry ice, students may use 2 straws to blow bubbles of CO<sub>2</sub> into the water. Cover the top of the container with your hand. Use safety goggles.

**Sample results for conductivity investigation:**

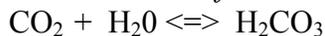


Sketch the results of your investigation and label the x and y-axis.

Observations:

What happens to the solution as CO<sub>2</sub> gas dissolved in the H<sub>2</sub>O? *The conductivity increased as the dry ice sublimed and CO<sub>2</sub> gas dissolved in the water.*

Why? *Some of the CO<sub>2</sub> gas reacts with water to form carbonic acid*



*which dissociates to form H<sub>3</sub>O<sup>+</sup> (also written H<sup>+</sup>) and HCO<sub>3</sub><sup>-</sup>*



*Carbonic acid is a weak acid so only a small fraction of the molecules dissociate. However, the increase in the ion concentration results in a higher conductivity.*

Do your results support the data collected from Lake Nyos? . (See Handout II of *A Killer Lake Case Study*<sup>1</sup> or Conductivity Profile from US-OFDA Report<sup>3</sup>.)

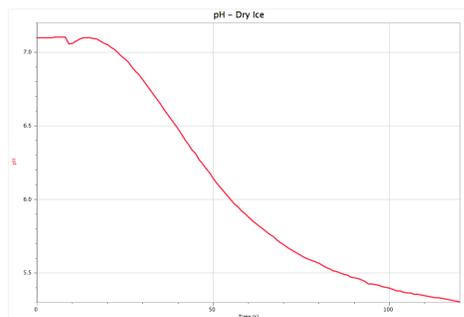
*The data from Lake Nyos indicates that conductivity increases with depth. So, the CO<sub>2</sub> concentration is greater in the monimolimnion (bottom layer).*

## ***2B - How does the dissolving of CO<sub>2</sub> in the lake affect the pH of the lake water?***

### ***Notes:***

1. A handheld pH meter may be used instead of the pH probes. Data will need to be recorded at intervals and graphed manually.
2. Rather than using dry ice, students may use 2 straws to blow bubbles of CO<sub>2</sub> into the water. Cover the top of the container with your hand. Use safety goggles.

### ***Sample results for pH investigation:***

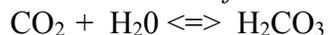


Sketch the results of your investigation and label the x and y-axis.

Observations:

What happens to the solution as CO<sub>2</sub> gas dissolved in the H<sub>2</sub>O? *The pH decreased and the solution became more acidic as the dry ice sublimed and CO<sub>2</sub> gas dissolved in the water.*

Why? *Some of the CO<sub>2</sub> gas reacts with water to form carbonic acid*



*which dissociates to form H<sub>3</sub>O<sup>+</sup> (also written H<sup>+</sup>) and HCO<sub>3</sub><sup>-</sup>*



*Carbonic acid is a weak acid so only a small fraction of the molecules dissociate.*

*However, since  $\text{pH} = -\log [\text{H}_3\text{O}^+]$ , the increase in the  $[\text{H}_3\text{O}^+]$  ion concentration results in greater acidity as evidenced by a lower pH value.*

Do your results support the data collected from Lake Nyos? (See Handout II of *A Killer Lake Case Study*<sup>1</sup>.) *The data from Lake Nyos indicates that pH decreases with depth showing a higher acidity in the lowest layer. So, the CO<sub>2</sub> concentration is greater in the monimolimnion (bottom layer).*

\*See Sources page for footnote references.